EU Regulation on type-approval of hydrogen vehicles and its implementing measures

European Commission
Enterprise and Industry

Concept of EU vehicle type-approval

- Objective:
  - to enable vehicles to be put on the market according to common uniform requirements
  - to ensure the proper functioning of the internal market in the European Union
- Fully harmonised technical provisions in all 27 Member States
- Principle of mutual recognition
- Regulated by Directive 2007/46/EC
  (Framework Directive – Whole Vehicle Type Approval system)

EU legislation on type-approval of hydrogen vehicles

- Commission proposal to adopt uniform type-approval requirements for hydrogen vehicles
- Common EU type-approval framework of hydrogen vehicles will:
  - support the deployment of hydrogen technology
  - bring environmental and safety benefits for the society
  - contribute to public confidence in the technology
- Based on ‘split-level’ approach:
  1. co-decision regulation (main requirements, European Parliament and Council, proposed by Commission)
  2. comitology regulation (technical details, Commission)

Regulation on type-approval of hydrogen vehicles

- REGULATION (EC) No 79/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 January 2009
  on type-approval of hydrogen-powered motor vehicles, and amending Directive 2007/46/EC
- published in the OJ on 4 February 2009

Applicable test procedures for hydrogen containers designed to use compressed (gaseous) hydrogen

Type of test	Applicable to container type			
	1	2	3	4
Burst test	✓	✓	✓	✓
Ambient temperature pressure cycle test	✓	✓	✓	✓
LBB performance test	✓	✓	✓	✓
Bonfire test	✓	✓	✓	✓
Penetration test	✓	✓	✓	✓
Chemical exposure test		✓	✓	✓
Composite flaw tolerance test		✓	✓	✓
Accelerated stress rupture test		✓	✓	✓
Extreme temperature pressure cycle test		✓	✓	✓
Impact damage test			✓	✓
Leak test				✓
Permeation test				✓
Boss torque test				✓
Hydrogen gas cycle test				✓

Regulation with implementing measures for the type-approval of hydrogen vehicles

- COMMISSION REGULATION (EU) No 406/2010 of 26 April 2010
  implementing Regulation (EC) No 79/2009 of the European Parliament and of the Council on type-approval of hydrogen-powered motor vehicles
- published in the OJ on 18 May 2010

State of play

- EC Whole Vehicle Type-Approval of hydrogen powered vehicles is possible at this time.
- European Commission is closely co-operating with Contracting Parties and stakeholders in the informal working group on HFCV-SGS under UNECE GRPS (1998 Agreement – Geneva)

Contacts

- Peter Broertjes (DG ENTR)
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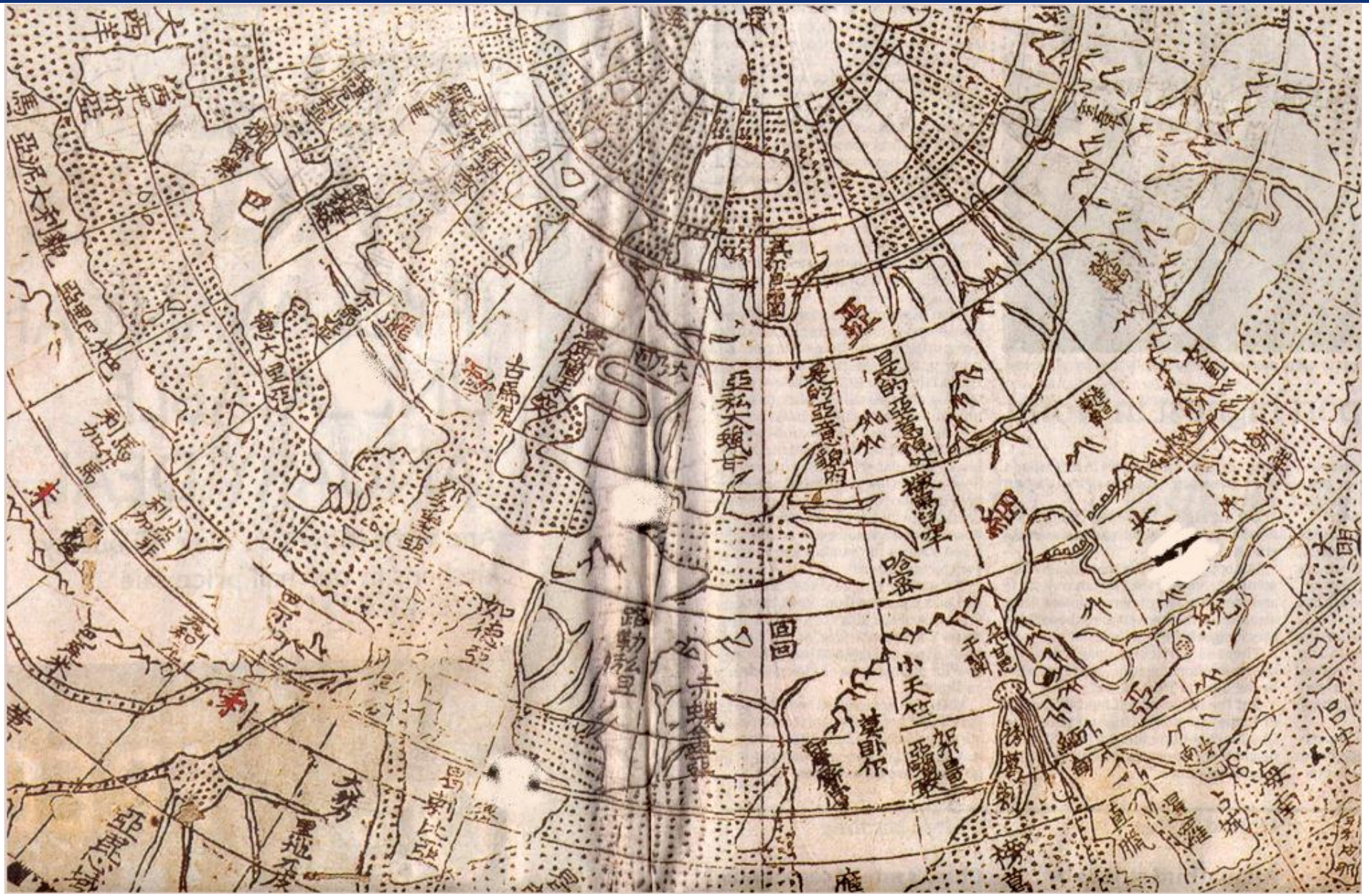
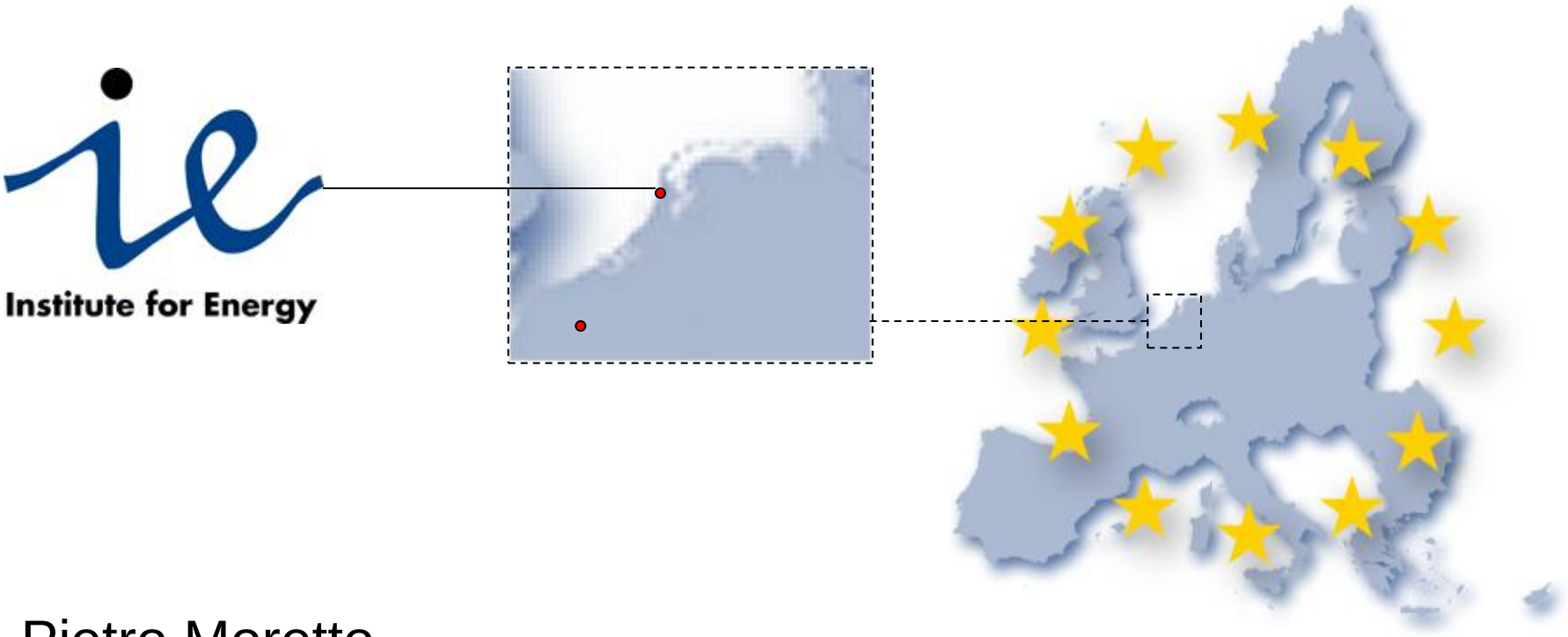
- Pietro Moretto (DG JRC)

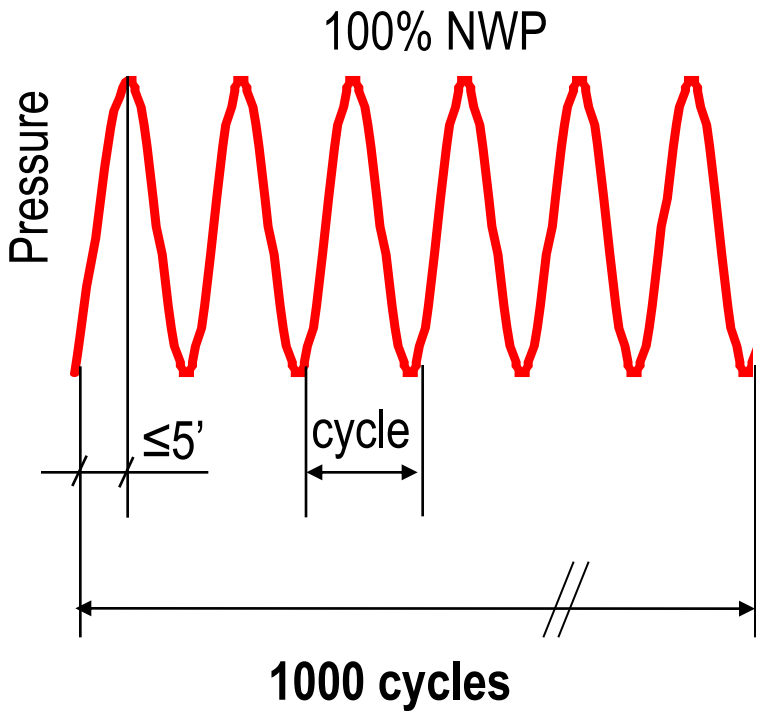


Two examples of technical issues



Pietro Moretto

H gas cycling test



☞ **Sampling: 1 tank** ☜

T not exceeding permitted values

Approval

EU: no leakage, permeation rate permissible

JARI

No leakage, no visible deterioration

ISO

24 hr static pressure period each 100 cycles

Clear indication where and which temperatures to measure

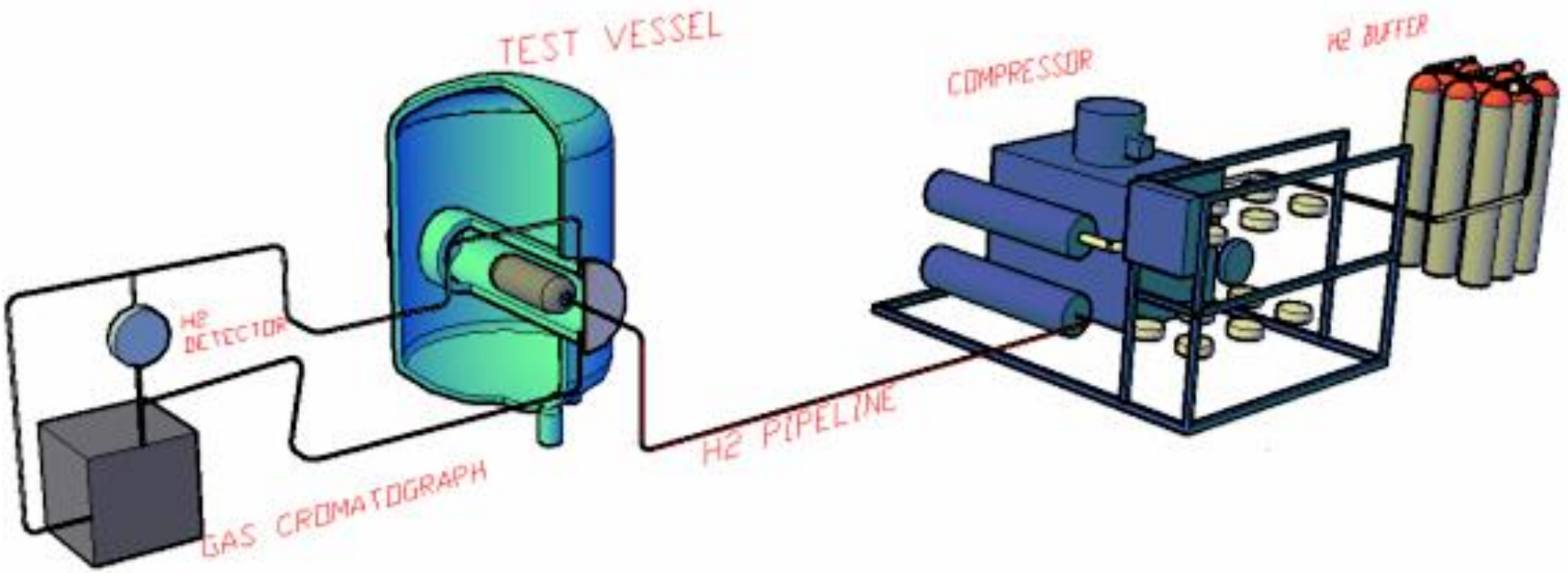
Sectioning of the container

SAE:

(only part of combined test procedure) / 1.25 NWP

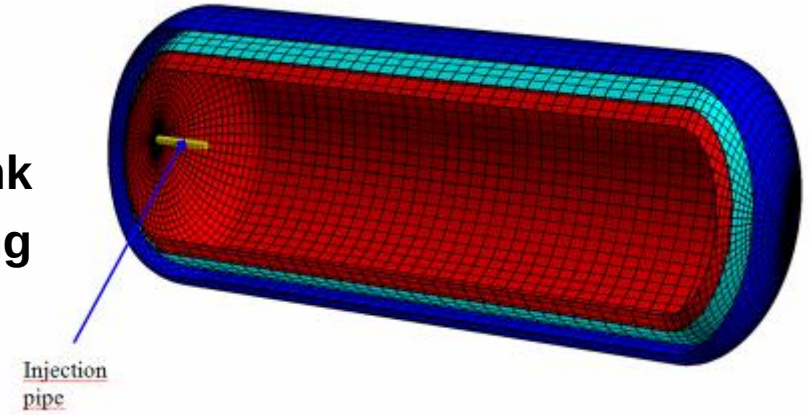
Temperature, humidity and filling rate requirements

Defuelling rate ≥ max. fuel-demand rate (also service refuelling rate).



T measurement inside tank

3D CFD modeling of fast filling



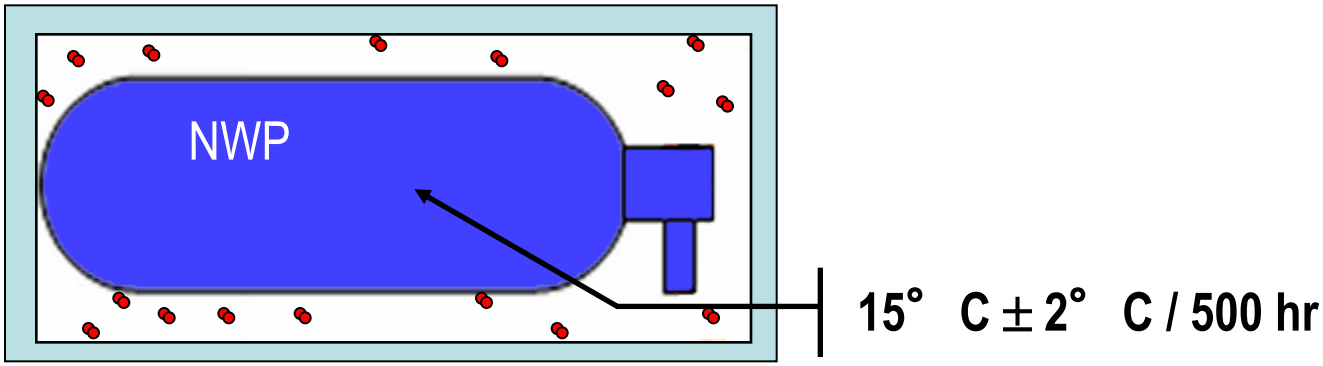
H2 cycle test

Are we performing the proper test?

- Liner geometrical stability (collapse?);
  - ☞ Occurring under which conditions, only a "test" issue?
- T evolution during emptying phase;
  - ☞ literature available for fast filling, no report known on low T during quick de-fuelling

Permeation (type IV)

☞ **Sampling: 1 container** ☜



EU approval criterion

Steady state permeation ≤ 6.0 Ncm³ / hr / l

Approval criteria

SAE: ≤ 75 Ncm³ / min

JARI: ≤ 2 Ncm³ / hr / l

ISO ≤ 2.0 Ncm³ / hr / l [35 MPa]

ISO ≤ 2.8 Ncm³ / hr / l [70 MPa]

Permeation

Well founded criterion?

- Where? boot of the car? Small (partially) ventilated garage?
  - ☞ need for experimental evidences / additional CFD modelling?
- How much: very low quantities measured;
  - ☞ need for a RRT?
- What: partial overlap between "leak" and "permeation" definition:
  - ☞ Evidence of local emission and/or thermally activated processes?

Wishes on Pre-normative Research

- Independent, scientific based, peer reviewed, publicly available results
- Statistically reliable general results, on all commercially available products (difficult to procure tanks for testing).
- Needs for accuracy ☞ comparison of independent results – well prepared, unbiased RRT protocol (*Jay, a role for IPHE RCS WG?*)